Integrated Pest Management for Turf

June 2000

Pam Charbonneau, OMAFRA Turfgrass Specialist

Table of Contents

Introduction

Fundamentals of IPM

1. Planning and Managing Turf
2. Pest Identification
   - The Pest Diagnostic Clinic
3. Monitoring
4. Thresholds
5. Record Keeping
6. Controls
   - Cultural Controls
   - Biological Controls
   - Chemical Controls
7. Evaluation

Introduction

Integrated pest management is a concept that has been practised in agriculture for 30 years or more. There have been many definitions for pest management put forth but the people working on integrated pest management in Canada have arrived at the following definition. Integrated pest management is a broadly based method that uses all suitable control measures to reduce pest related losses to an acceptable level with the goal of respecting genetic diversity and reducing risks to human health and environment.

The fundamentals of an integrated pest management program are:

- planning and managing turf to prevent organisms from becoming pests
- identification of potential turf pests
- monitoring populations of pests, beneficial organisms and all other relevant environmental factors
- establishment of damage/action threshold
- application of cultural, physical, biological, behavioural and chemical control measures to maintain pest populations below threshold levels
- evaluation of the effects and efficacy of pest control measures used

| Top of Page |

Fundamentals of IPM

Planning and Managing Turf

Planning and managing turf is perhaps the most important part of an integrated pest management program and it is often overlooked. It takes careful planning to develop a site where turf can be grown with maximum health and minimum stress. Two of the factors that must be considered in a golf course, sports field or other turf areas are root zone mixture and subsurface drainage. Turf which is grown on a poorly drained, compacted soil will be more prone to diseases, insects and weeds. Having a properly constructed and drained root zone is an important factor that will help minimize future turf problems.

Another part of the planning is selection of the appropriate turf species and cultivars for the intended turf use. This will result in fewer pest problems. Plant breeders are constantly releasing varieties with improved resistance to drought, insects and diseases. It is in your best interest to be aware of new varieties and their attributes and to have access to data from turfgrass evaluation programs in your area. Results from the Guelph Turfgrass Institute variety trials can be found at www.uoguelph.ca/GTI (External link - see Disclaimer). Another valuable resource is the National Turfgrass Evaluation Program in the United States. Results from the trials throughout the U.S. can be obtained from their website at www.ntep.org.(External link - see Disclaimer). Work closely with you local seed companies and stay on top of the latest releases.

Intelligent planning of a turf area should be followed by good management practices. The importance of proper irrigation practices, including water quantity and how often it is applied, can not be over-emphasized. Watering too frequently can rob turf roots of much needed oxygen. Pore spaces which are usually filled with air will be filled with water when turf is watered too frequently. This can cause root death. Watering too shallowly will often cause the roots to be restricted to the upper 5 cm. Watering too infrequently or too shallowly can cause restricted root growth. Either of these situations can cause turf stress which may predispose it to pest damage.

Turf plant health is best maintained through balanced nutrition. Either too little fertilizer or too much can cause pest problems. Dollar spot will be rampant under a low nitrogen regime, where diseases such as Pythium and brown patch attack highly fertilized, lush turf.

Proper mowing height and frequency are also important turf management considerations. Turf which is mowed at the 1/8th inch (2-3 mm) height will be more prone to stress and hence more susceptible to pest problems. Infrequent mowing can cause scalping of the turf. This affects carbohydrate reserves and root growth. Of equal importance is regular thatch control through verticutting and topdressing as well as aeration for alleviation of compaction. Thatch harbours disease spores and many insects also make their home in the thatch.It is also important to pay particular attention to your turf microclimate. Turf needs a minimum amount of sunlight to survive and morning sun is preferred to afternoon sun. This ensures that the turf leaves dry off quickly in the morning shortening the leaf wetness duration. Air movement over turf is also essential to stimulate evapotranspiration which is necessary for water and nutrient uptake. "The best defense is a healthy offense" holds true for turf. Maintaining healthy, stress free turf is fundamentally important and it can not be overlooked in an integrated pest management plan.

| Top of Page |

Pest Identification

When a pest is encountered during routine monitoring, it is essential to correctly identify the pest. A 10x hand lens can be useful for examining both turf insect pests as well as disease symptoms and lesions. Misdiagnosis may result in improper pesticide applications. Often wilting and yellowing turf leaves are mistaken for disease damage when the real cause is a root feeding insect. Obviously a fungicide applied to this problem would not halt the damage and it would constitute a misapplication of pesticide. Once the pest is identified, it is important to determine which stage the pest is in and which stage it is most susceptible to a pesticide treatment. If you are unable to identify a turf pest, a sample, including

the diagnostic fee, can be sent to your local provincial pest diagnostic clinic. The sample which you are sending should be the size of a golf course cup changer or larger. It should include diseased and non-diseased turf. Include at least 5 cm of soil with the sample in case the problem is a root problem. Wrap the sample in dry newspaper or paper toweling and place it securely in a box. Courier the sample to ensure it arrives at the clinic in good shape. The address of the clinic in Ontario is:

The Pest Diagnostic Clinic

Laboratory Services Division

University of Guelph

P.O. Box 3650, 95 Stone Rd. W., Zone 2

Guelph, Ontario

N1H 8J7

(519) 767-6256

| Top of Page |

Monitoring

Monitoring is another of the key components of an integrated pest management program. The goal of monitoring is to determine the presence and activity of a pest before turf loss occurs. Monitoring consists of regular, systematic turf inspections for pests. This is usually done by visual inspection and may include specific sampling techniques. Frequency of monitoring is determined by the level of turf maintenance and available staff. In a golf course situation , greens and tees should be monitored daily, fairways should problably be monitored weekly. Familiarity with the life cycles of all turf insects and diseases and when to monitor for them is important. Keeping track of weather and knowing the conditions which favour disease and insect development are important parts of a pest monitoring program. Once a pest management action is taken, monitoring will determine if the treatment was successful in reducing the pest population.

Knowing when to start monitoring for a specific pest is not always easy. Fortunately there is a relationship which exists between insect development and temperature that can be predicted with some accuracy. Studies on insect development reveal there is a critical temperature below which no insect development takes place. This is referred to as the base temperature for that insect. Once this base temperature has been reached, the speed at which insects develop depends on the amount of heat accumulated above the base temperature. Calculating cumulative average temperatures above the base temperature (degree-days) will give a good idea of when an insect is active. Turfgrass entomologists have studied many of the turfgrass insects and they have determined the number of degree-days necessary for the insect to reach a stage where monitoring should begin. To use this system it requires having access to accurate local weather data or have your golf course purchase a weather station.

The concept of temperature affecting the rate of development is applicable to plants as well as insects. Because not every turf manager has access to a computerized weather data gathering system which automatically calculates degree days, turfgrass entomologists have used common plants in the landscape to signal when insect events are likely to take place. This is referred to as plant phenology relationships. Some common plant phenological relationships can be found in **Table 1.**

Table 1: Insect - Plant Phenological Relationships

INSECT	PLANT PHENOLOGY	INSECT STAGE
Annual Bluegrass Weevil	Forsythia full bloom	moving from over-wintering sites
Annual Bluegrass Weevil	Flowering dogwood full bloom	end of migration from over-wintering sites
Black Turfgrass Ataenius	full bloom of Van Houtte spirea and horse chestnut	presence of eggs
European chafer	full bloom of Catalpa	peak adult flights
Hairy chinch bugs	full bloom of bird's-foot trefoil	peak egg laying

To establish a monitoring schedule, begin by defining monitoring units. This could consist of a golf hole subdivided into green, tee, fairway, or a home lawn subdivided into front and back yard or a sports field subdivided into two goal mouths and the goal crease area. Determine how often each area will be monitored.

| Top of Page |

Thresholds

Threshold describes the number of pests that turf can tolerate without causing unacceptable damage. When pest levels exceed the threshold, control action should be taken.

It is important to remember that most thresholds are simply guidelines and that it is also important to consider the overall health and vigour of the turf when deciding if a treatment should be made. Thresholds have been established for many common turf insect pests. Weed and disease thresholds are somewhat more subjective and should be established by the turf manager in consultation with the turf user group.

| Top of Page |

Record Keeping

Accurate record keeping is important for the success of an IPM program. Develop data sheets which allow for quick, accurate data recording. A map of the pest management unit should be included with or be part of the data sheet (Figure 1 and Figure 2). A sample of the data collection sheet that is used in the OMAFRA Turf monitoring projects is shown in Figure 1. Records allow you to make informed pest management decisions. It is also important to record all pesticide treatments made, date of application, active ingredient and if the treatment was successful.

Figure 1

APPENDIX C: Turf Scouting Record

DATE: _____ SCOUT NAME: _____ SITE LOCATION: _____

GREEN OR TEE #: _____ PLAYING FIELD: _____ HOME LAWNS: _____

CONTACT INFORMATION

NAME: _____

ADDRESS: _____

_____

PHONE: _____

SITE EVALUATION

			H	M	L
Age of Turf: ____	Compaction:	❑	❑	❑
Seed or Sod: ____	Thatch Layer:	❑	❑	❑
Sun/Shade: ____	Soil Type:	❑	❑	❑

TURF SPECIES

Kentucky Blue	❑	Tall Fescue	❑
Bentgrass	❑	Annual Bluegrass	❑
Fine Fescue	❑	Perennial Ryegrass	❑

ABBREVIATIONS

DISEASES	Abb.	INSECTS	Abb.
Anthracnose	A	Annual B. Weevil	AW
Brown Patch	BP	Black Turfgrass	BT
Dollar Spot	DS	Blue Billbug	BB
Fusarium Patch	F	Chinch Bug	CB
Gray Snowmold	GS	Cutworm	C
Leaf Spot	LS	European Chafer	EC
Patch Disease	YP	Grub Type	G
Pink Snow Mould	PS	Unknown/Other	UI
Unknown/Other	UD		

COMMENTS:

_____

_____

_____

_____

_____

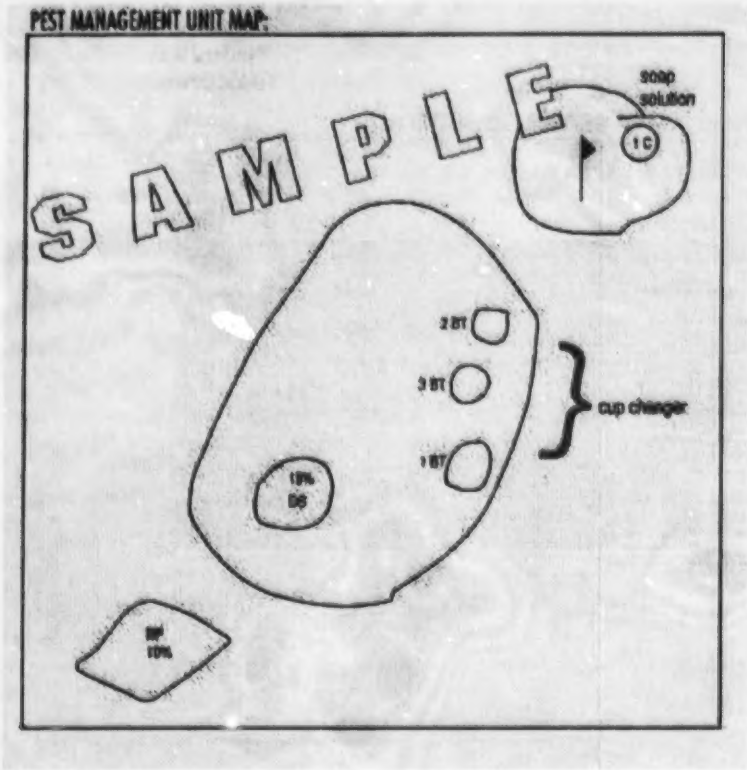
_____

_____

_____

PEST MANAGEMENT UNIT MAP:

Figure 2



| Top of Page |

Control

Cultural Control

As mentioned previously, turf integrated pest management is based on the promotion of healthy turf through sound cultural practices such as balanced fertility based on a soil test, adequate irrigation, cultivation techniques to alleviate compaction, thatch management and proper mowing height. Integral to the promotion of healthy turf is selecting the best adapted turf species for the intended use. Whenever possible, choose species and cultivars which are disease resistant. Cultivars of perennial ryegrass, tall fescue and fine fescue are available which contain endophytic fungi which repel leaf feeding insects.

| Top of Page |

Biological Controls

Biological controls are biological agents (fungi, bacteria, viruses, nematodes and insects) which attack turfgrass pests. Beneficial insects such as rove beetles and ground beetles which eat turf insect pests are a form of biological control. Another example of a use of a biological control is the application of composts as a topdressing. These composts contain micro-organisms which may suppress diseases. There are some biological control agents which are commercially formulated which are applied in the same way as a pesticide is applied. Parasitic nematode (*Steinernema carpocapsae*) and *Heterorhabditis bacteriaphora* are examples. Currently, there is a great deal of research being conducted on new forms of biological control agents for turf pests and the future of these types of controls looks promising. Information on parasitic nematodes can be found at www2.oardc.ohio-state.edu/nematodes/default.htm (External link - see Disclaimer).

| Top of Page |

Chemical Control

Pesticides are an important part of an integrated pest management program. Pesticide treatments should be used only when a pest is present in sufficient levels to cause turf damage. Treatments should be made when the pest is most susceptible to the pesticide. Spot treatments are preferred when a pest problem is restricted to an isolated area. Applying pesticides with a properly calibrated sprayer insures the appropriate amount of pesticide is applied on the turf. When selecting a pesticide care should be taken to select the least toxic alternative which is the least mobile as far as leaching is concerned and has the least possibility for persistence in the environment. The time of day that a pesticide is applied can be important. For instance, to control nocturnal insects, insecticide treatments should be applied in the evening.

Another important principle to keep in mind when using pesticides is to alternate pest control

products with different modes of action to minimize the possibility of pest resistance developing.

| Top of Page |

Evaluation

The final step of any pest management decision is evaluation. Without an evaluation after a pesticide treatment it is impossible to tell if the treatment was successful. Evaluation of your IPM program should include analysis of treatment results, fine tuning of monitoring techniques and comparison of number of treatments from year to year and before IPM was implemented. A turf integrated pest management program should evolve and improve over time and evaluation of current practices is essential for this evolution.

Table of Contents

For more information...regarding integrated pest management for turfgrass contact Pam Charbonneau at: pcharbon@omafra.gov.on.ca or visit the GUELPH TURFGRASS INSTITUTE website at http://www.uoguelph.ca/GTI...the place to surf for turf!

| Top of Page |

This Infosheet was authored by: Pam Charbonneau, OMAFRA Turfgrass Specialist.
For more information... regarding contact Pam Charbonneau at: pcharbon@omafra.gov.on.ca

| Top of Page |

| Crops Home Page |

| Central Site | Feedback | Search | Site Map | Français |
| Home | What's New | Calendar | Products | News Releases |

Ontario

This site maintained by the Government of Ontario, Canada

This information is provided as a public service, but we cannot guarantee that the information is current or accurate.
Readers should verify the information before acting on it.

Feedback and technical inquiries to:crops@omafra.gov.on.ca
© Copyright 2002 Queen's Printer for Ontario
Last Updated: July 3, 2001